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Chair’s Message

Dear Friends,

As we continue to deal with the pandemic, long lead-times, and now inflation and conflict, we begin to feel around for something that resembles a new “normal”. We dipped our toes back into in-person meetings with vaccine requirements and red/yellow/green lanyards to show our comfort with physical distancing. It was great to see so many friends and colleagues and to engage in the fabled hallway chats about science!

This year our seventh annual Workshop focused on Exploring Physics with Quantum-Enabled Precision Measurement. We had 129 attendees and a lively poster session. Both April and DAMOP were hybrid, while our Workshop at DAMOP was in-person only. Meeting format will be a large topic of discussion in the coming year, both for our group and the APS at large.

Members of our group are united by our interest in high precision and fundamental physics, and we display a wide diversity of approaches including experiments on single tabletops, at medium to large facilities, and in space. One of the highlights of our programming is meeting people answering similar scientific questions in dramatically different ways.

At our Executive Committee meeting each year, we review the group’s membership. Thanks to new members signing up at conferences and the Workshop, we are at an all-time high! And yet, the demographics show we’re missing important segments of the population. The APS has invested in many programs to help diversify physics. Since members often join as students and postdocs, I encourage you to participate in inclusion programs at your home institution and in your own research group.

Speaking of students, I am excited for the new bylaw change that adds two graduate student members to our Executive Committee. We’ve always been a group that promotes our students through papers, talks, posters, and prizes. This will be an opportunity to provide leadership development and also to include their voices and perspectives in our decision-making.

I want to thank the members of the Executive Committee as well as the tireless APS staff, who have helped put together the programming and prizes discussed in the rest of this Newsletter. And thank you, the members, for attending conferences in-person or virtually, for being welcoming to all who share our curiosity, and for continuing to excite us with discoveries that lie at the next digit beyond our current knowledge.

Yours,
David Hanneke
GPMFC at the April APS Meeting

This year’s April meeting was April 9-12 with a hybrid format. The in-person portion was in New York City.

The GPMFC sponsored one invited session:

- Precision Measurements with Quantum Sensor Networks

and two contributed sessions:

- Precision Tests of Physics Laws I
- Precision Tests of Physics Laws II

GPMFC at DAMOP

This year’s DAMOP was a hybrid meeting, with the in-person portion in Orlando, Florida.

The GPMFC held its Executive Committee meeting and its Business meeting at the 2022 DAMOP meeting. The Business meeting was held on 5/31/22 at 6:30pm EDT and was open to all GPMFC members.

The following invited sessions were organized by the precision measurement subcommittee of the DAMOP program committee.

- Focus Session: Fundamental Physics with Radioactive Species
- Precision Measurements with Microscopic Levitated Objects
- Searches for New Physics

Seventh annual workshop of the GPMFC

This year’s workshop was held the Monday before DAMOP on the theme of Exploring Physics with Quantum-Enabled Precision Measurements. It explored the potential applications of the “second quantum revolution” on precision measurement. Highlights included quantum-enhanced sensing, squeezing, measurements beyond the standard quantum limit, entanglement, hardware & software approaches for control of individual quantum systems, and quantum simulation and computation, all with applications to fundamental physics, searches for Beyond-Standard-Model physics, metrology, and other precision measurements.

Workshop Program:
• An Introduction to Quantum Enhanced Sensing with Atoms and Photons
  Ivan Deutsch, University of New Mexico
• Evidence of two-source King nonlinearity in spectroscopic fifth-force search in Yb⁺
  Diana Aude Craik, MIT
• JILA’s search for the electron’s electric dipole moment: a unique approach to searches for new physics
  Tanya Rousey, JILA/NIST
• Quantum metrology enhanced by quantum error correction
  Sisi Zhou, Caltech
• Optimal metrology with programmable quantum sensors
  Christian Marciniak, University of Innsbruck
• Quantum opto-mechanics and dark matter across disparate scales
  Daniel Carney, Berkeley National Lab
• Control and detection of molecules in optical tweezers
  Lewis Picard, Harvard University
• The HUNTER experiment: Searching for Sterile Neutrinos in laser trapped ¹³¹Cs
  Paul Hamilton, UCLA
• Bounds on the bizarrity of the Universe from experiments with trapped, cold, charged particles
  Hartmut Haeffner, University of California, Berkeley
• Simulating QCD with quantum tools?
  Zohreh Davoudi, University of Maryland
• New Physics with Nuclear Spins
  Will Terrano, Arizona State University
The GPMFC workshop organizers. From L to R: Jacob Taylor, Dave Leibrandt, David Hanneke, and Jaideep Singh.
GPMFC chair David Hanneke introducing the 2022 GPMFC workshop.
Congratulations to our Topical Group's 2021 APS Fellows:

Dr. David Leibrandt, NIST

“For exceptional scientific creativity and leadership in designing and demonstrating a state-of-the-art trapped ion optical clock with the lowest reported clock systematic uncertainty of 0.94 x 10^-18, and for implementing novel clock comparisons.”
Dr. David Leibrandt

Professor Piet Schmidt, PTB

“For the development of quantum logic spectroscopy techniques and their application in pioneering high precision measurements of optical transitions in atoms, molecules, and highly charged ions.”

Prof. Piet Schmidt
The Topical Group is entitled to propose candidates for Fellowship in the APS. **Please consider nominating a member of our group to honor their contributions to our field.** Nomination instructions can be found [here](#). This year, the Fellowship Committee is chaired by Tanya Zelevinsky (Columbia University) and includes Andrew Geraci (Northwestern University) and Eric Hessels (York University, Canada). The deadline for nominations for this year was May 3, 2022. The nomination cycle will open again in January, 2023.

**GPMFC Prizes and Awards**

We would like to congratulate all of the recent winners of GPMFC prizes:

**2022 Norman F. Ramsey Prize**

Professor Mikhail Lukin, Harvard University

“For contributions to quantum information science, sensing, and physics, including the development of Rydberg atom-based quantum simulators.”

![Professor Mikhail Lukin](image)

Mikhail Lukin received the Ph.D. degree from Texas A&M University in 1998. He has been a Professor of Physics at Harvard since 2004, where he is currently a co-Director of Harvard-MIT Center for Ultracold Atoms. His research interests include quantum optics, quantum control of atomic and nanoscale solid-state systems, quantum metrology, nanophotonics, and quantum information science. He has co-authored over 350 technical papers and has received a number of awards, including the Alfred P. Sloan Fellowship, David and Lucile Packard Fellowship for Science and Engineering,
NSF Career Award, Adolph Lomb Medal of the Optical Society of America, AAAS Newcomb Cleveland Prize, APS I.I.Rabi Prize, Vannevar Bush Faculty Fellowship, Julius Springer Prize for Applied Physics, and the Willis E. Lamb Award for Laser Science and Quantum Optics. He is a fellow of the OSA, APS, and AAAS and a member of the National Academy of Sciences.

The Ramsey award recognizes outstanding accomplishments in the two fields of Norman Ramsey: atomic, molecular, and optical physics; and precision tests of fundamental laws and symmetries. The Prize consists of a $10,000 check, a certificate citing accomplishments, and travel support for the recipient to attend the DAMOP annual meeting at which the prize is presented.

Please consider nominating a member of our topical group for the Ramsey Prize. The nomination deadline for the 2023 prize was June 1, 2022 but nominations for the 2024 prize can be submitted. More details are available here.

**Francis M. Pipkin Award**

The Francis M. Pipkin award is presented every two years. The next award will be presented in 2023. The deadline for nominations was June 1, 2022. The next cycle will have a deadline in mid-2024. More details are available here.

We’re grateful to our members who have agreed to serve on our prize committees.

**Norman F. Ramsey Prize Committee:** Kristan Corwin (Chair, GPMFC), Irina Novikova (Vice-chair, DAMOP), Mikhail Lukin (’22 recipient), John Bohm (DAMOP), Nan Yu (DAMOP), Jonathan Weinstein (GPMFC), Hamish Robertson (GPMFC)

**Francis M. Pipkin Award Committee:** John Doyle (Chair), Reina Maruyama (Vice-Chair), Andrew Ludlow (’21 recipient), David Kawall, Brad Plaster.

**GPMFC Elections**

Congratulations to the newly elected incoming GPMFC officers: Vice Chair: Wolfgang Korsch (University of Kentucky), Secretary/Treasurer: David Kawall (University of Massachusetts Amherst), Member at Large: Ronald F. Garcia Ruiz (MIT), and Member at Large: Fred Wietfeldt (Tulane University). Their terms will commence on Oct 1, 2022. Many thanks to the Nominating Committee: Adam Kaufman (NIST) Subhadeep Gupta (UW), and Lindley Winslow (MIT), as well as all candidates who participated in the election.
GPMFC Bylaws Change

In addition to voting for Executive Committee members, this year’s GPMFC election included voting on a proposed change to the GPMFC bylaws to include two student representatives on the Executive Committee. Each student would be elected for a two-year term staggered by one year from the other student. The annual elections will be amended to include a student representative vote as well.

While we were modifying the bylaws for this change, we decided to make minor wording updates as well to bring them more in line with wording used by other APS topical groups and divisions.

The bylaws change was approved by 92% of the membership who voted in the recent GPMFC election.

The following summarizes the changes. To view the complete bylaws, please see: https://engage.aps.org/gpmfc/governance/bylaws

Bylaws Amendment Synopsis

- Amended to include two Student Representatives to the Executive Committee. See Article V.2 and Article VII for associated changes.

- Minor changes were made to conform to format of other unit bylaws (references to Vice-Chair changed to Vice Chair and Secretary-Treasurer changed to Secretary/Treasurer; removed “CEO” in preamble because CEO is no longer referenced in the bylaws.).

- Added lines for Council approval date and Unit Member ratification at the top of the bylaws.

- Amended pronouns throughout to gender-neutral language, at unit’s request.

- Removed Publications Committee (Article VIII.4) due to inactivity over the past several years.

Retiring Officers

A hearty thanks goes out to Derek Jackson Kimball, who is wrapping up four years on the Chair line as Past Chair this year, to Eric Burt, who is finishing up a three-year term as our Secretary/Treasurer, to Lindley Winslow and Jaideep Singh, who have each served three years as Members-At-Large, and to David Schultz, who has been our Representative on the APS Council.
Student Poster Competition

The GPMFC awarded two “Best Student Poster” prizes at the 2022 DAMOP GPMFC poster session, with a prize of $500. Congratulations to our two Student Poster Competition Winners:

- Nia Burrell, Northwestern University, *Ultrasensitive Force Sensing with Optically Levitating Nanoparticles*

  ![Nia Burrell](image1)

- Kon Leung, Columbia University, *Molecular vibrational spectroscopy with 13-digit accuracy*

  ![Kon Leung](image2)

We thank the student poster competition committee for the work they have done to put this together. Student Poster Competition committee members were Beatrice Franke and Nick Hutzler. The competition judges were David Hanneke, Derek Kimball, Dave Leibrandt, and Jaideep Singh.

2022 Annual APS Leadership Meeting

This January, the APS held its Annual Leadership Meeting remotely. This meeting is a gathering of officers from the Divisions, Sections, Topical Groups, Forums, and
Chapters. There is a day of advocacy on Capitol Hill, broad discussions about the challenges and opportunities for physics and today’s physicists, the official business meeting of APS, and many opportunities to interact with other officers and with the staff of APS. Panel discussions included *Countering Misinformation* and *Broadening Our Community*. 